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list, so far as pertains to the teaching of elementary botany, is provided. Since school boards are sometimes in a hurry for data, it would have been well to facilitate the teacher's task by indicating in the list itself the relative values of the various books, so that a limited choice might be quickly made. This end is, however, largely attained in the reading of a chapter, but in a less concise way.

A very valuable addition in the present book are the suggestions given for the growing of plants in windows in pots and boxes. But few schools are able to do more than this, and any practical help in this apparently easy, but really rather difficult matter, will prove very welcome, especially as this part of the text comes from the hand of Mr. Edward J. Canning, than whom few are more skilful in horticultural practise. An additional suggestion will not be amiss, that tin cans are usually better than pots for house culture. Indeed, they are exceedingly useful for much laboratory experimentation. The jagged rims may be melted off, while a coat of asphalt paint will make them sightly.

During the past few years Professor Ganong and some of his more advanced students have systematically investigated the commoner plants with particular reference to their adaptability for demonstration and laboratory experimentation; while Professor Ganong himself has worked arduously in the perfection of apparatus of more refined type adapted to school and college use. The excellent data and apparatus thus obtained are available in *The Botanical Gazette* and in another book, "Plant Physiology," properly to be regarded as a companion volume to "The Teaching Botanist," and which should, with this, be in the hands of every ambitious teacher.

The second part is devoted to a detailed discussion of a synthetic course, the content of which is widely known through the work of the Committee on Education of the Botanical Society of America, of which Professor Ganong is the chairman. The method of presentation is left, in the report of that committee,¹

¹ This report is printed as an appendix.

as a matter of choice to the teacher, but the book before us will do much to advance the recognition of the principle of synthesis. The account, covering 150 pages, may be regarded as a condensed log of a successful teacher, and gives the practical pedagogy on every difficult and important point. The fundamental principle, that of synthetic treatment of allied structural and physiological topics, has much to commend it, the chief of which is the overwhelming importance of physiology. The reviewer is glad that the efforts of Professor Ganong have been in this direction, since it is principally this phase of botanical science which must come to the front in the botany taught in schools of agriculture. These are rapidly multiplying, and many young teachers are going out year by year into this work who need much help along the right path.

Of most permanent importance, in the opinion of the reviewer, is the chapter on the Training and Traits of the Good Botanical Teacher. It is full of good common sense coupled with a clear vision of the ideal. The teacher who is troubled because he can not do research will find in this homily some other matters to think about and other ways of advancing his science than in striving to do the work of others whose business it is. There must be a great majority of good botanical teachers whose chief interest is the development of the teaching aspect of the science, and whose effort is legitimately expended in this way. To such Ganong brings a message.

FRANCIS ERNEST LLOYD

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Lehrbuch der anorganischen Chemie. Von Professor Dr. H. ERDMANN, Direktor des Anorganisch-Chemischen Instituts der Königlichen Technischen Hochschule zu Berlin. Fünfte Auflage. (Dreizehntes bis Sechszehntes Tausend.) Mit dem Porträt des Verfassers in Gravüre, 319 Abbildungen, 95 Tabellen, einer Rechentafel und Sieben Farbigen Tafeln. Braunschweig, Friedrich Vieweg und Sohn. 1910. Pp. 805. 16 Marks.

A new edition of "Erdmann" will be welcome to every chemist who has read the earlier editions. This book is well known but not as well as it deserves. When the first edition appeared thirteen years ago, it was recognized as the best existing one-volume text-book of descriptive chemistry; each succeeding edition is an improvement on its predecessor.

The present fifth edition has a melancholy interest as the last work of the author. Erdmann wrote the preface but a few days before his accidental death by drowning while sailing on a lake near Berlin. He was an active worker in several fields of chemistry, but will be best remembered for the "Lehrbuch."

What are the chief features of this book? It is written for advanced students, not for beginners. It is essentially descriptive. It opens with a condensed but admirably clear and complete statement of physical-chemical laws and methods contained in an introduction of 84 pages. The remainder of the book treats of the elements and their compounds, and is chiefly descriptive, both chemical and physical properties being considered; technical methods and experiments profusely illustrated by excellent diagrams form a prominent feature of the book.

To give the reader an idea of the scope of the book, the headings of the paragraphs of one of the shorter and simpler chapters may be given. It is worth the reader's attention. The chapter on hydrogen fills 21 pages; it includes 4 tables, 22 diagrams and a beautiful colored plate of the spectra of hydrogen, oxygen and nitrogen. The chapter begins with the present and the old names of the element in German and the present name in English, French, Russian and Spanish. The physical constants follow; then the following paragraphs—occurrence in the universe; on the earth free and combined; relative weights of chief elements in earth's crust compared with relative number of their atoms; discovery; preparation; hydrogen as by-product; as unit of gas densities; free hydrogen has the density 2; specific gravity of hydrogen compared with air and with water—determinations of Regnault, Rayleigh, Cooke, Leduc, Morley

and Thomsen; normal pressure and normal temperature; polarization; molecular speed; diffusion; effect of change in temperature and pressure on expansion; hydrogen the legal basis of thermometry; Kelvin's phenomenon; liquid hydrogen; critical pressure; chemical activity; action on water, on the halogens; on oxygen; combustible; metallic modification of hydrogen; nascent state; as unit of atomic weights; density in palladium alloy compared with densities of alkali-metals; as reducing agent; practical uses; lifting capacity of balloons; filling balloons; hydrogen as fuel; spectrum. Then follows the section on experiments and technique with the diagrams. In addition to the familiar apparatus and experiments may be mentioned Bucher's apparatus for quick generation of large volumes of hydrogen from aluminium and sodium hydroxide, or from calcium hydride (hydrone); Kammerlingh-Onnes's apparatus for liquefying hydrogen; the triple-walled Weinhold modification of the Dewar flask; experiments with liquid and with solid hydrogen; griessheim process for preparation of large quantities of hydrogen.

Not only do we find matter in this book which is not given in other one-volume text-books, but we find something new concerning nearly every element and important compound which was not in the last edition, for the author introduced a reference to every important discovery if it appeared in the journals before the edition went to press.

The elements are treated in the main in the order of the periodic system, though Erdmann makes but little use of the system, describing it in the closing chapter. His own arrangement of the elements in a spiral curve—given on a separate table—is interesting.

A singular flaw in the book is the lack of a proper treatment of the subject of steel. The data given are scant, scattered and empirical. Thus vanadium steel is barely mentioned and only in the chapter on vanadium. This is, however, but a small matter compared with the general excellence of the book. Translations are not known to the reviewer. The frequent appearance of new editions has probably de-

tered translators. The cost of adequate production might deter publishers. Most of those who need a book of this kind would prefer to use the original.

The publishers of the book have used a thin, tough, opaque paper and a close clear type, thus bringing into one volume of readable size matter which with other paper and type would fill two volumes. The diagrams and particularly the colored spectra plates are very fine. The price of the book is comparatively very low.

E. RENOUF

Sewage. By A. PRESCOTT FOLWELL. Sixth Edition. 8vo, pp. 506, cloth. New York, John Wiley & Sons. \$3.00.

The first 358 pages of this new edition are devoted to detailed descriptions and directions for the design, construction and maintenance of sewers and their various appurtenances, as used for the removal of those wastes that are conveyed from the household by water-carriage in underground channels. The book is a comprehensive one in this respect, serving not only as a useful guide to the student in sanitary engineering, but also as a valuable reference book to the practical engineer and the sanitarian.

Specifications, forms of contract and procedures for putting such work under contract are given in a manner to engage the attention of the city official. Cost data are analyzed with much detail and should prove of interest to engineers and contractors.

Since the first edition of this book appeared eleven years ago, there have been a number of features which have arisen for discussion, and these have been judiciously embodied in the sixth edition. From the strictly engineering standpoint, they relate particularly to the use made of concrete.

The chapters on the ventilation and flushing of sewers are well prepared. They wisely advocate the construction and operation of sewers so as to keep as fresh as possible both the sewage itself and the air within the sewers. The importance of guarding against putrefaction in sewers and sewer-connections

is becoming more and more appreciated, particularly by those who have to do with sewage purification. It is gratifying to note that the old idea of trapping the main house drains is not favored, but preference is given to ventilating the street sewers through the house connections with pipes extending to above the roofs, as is the custom on the continent of Europe. The discussion of this subject should prove of interest to sanitarians.

Pages 359-492 are devoted to the subject of sewage disposal and have been practically rewritten. All the principal aspects of sewage disposal by dilution and by treatment in works of artificial construction of various types are well outlined. The book is not intended to be an exhaustive treatise on sewage disposal, but it is a well-balanced review of the subject which will prove serviceable to students in sanitary science, as well as to health officers, city officials or others interested in the general subject.

The book has been brought well up to date, as is shown by the statements given with respect to the Emscher tanks for the clarification of sewage as recently practised in western Germany with a marked degree of success, showing much improvement over the so-called "septic tanks."

The point of view that prevails generally throughout the closing chapters of the book is a practical one. Experiences with sewage disposal on a large scale are used frequently in illustrating methods and processes.

Without doubt, the enlarged edition of this book should prove very useful in the classroom and in the library of those who are interested in the advancement of sanitary science. The book is well edited and indexed, and it contains 46 illustrations and 31 tables.

The arrangement of the book for class-room use will doubtless appeal to teachers, as it shows the results of Professor Folwell's successful experience for some years as head of the department of civil engineering of Lafayette College, prior to his taking the editorship of the *Municipal Journal and Engineer*.

GEO. W. FULLER